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ABSTRACT

Changes in the world make it urgent to give serious, conscientious and systematic attention to teaching thinking skills to children throughout the school curriculum, across all grade levels, and in all subjects. The nature of thinking is discussed in terms of its key components--cognitive operations, certain kinds of knowledge, and certain attitudes and dispositions. Other characteristics--purpose, development, modalities, context, and environment are considered next, as are various perspectives--particularly the constructivist perspective. All of this information provides background for the final consideration, namely, strategies which have been suggested by various experts to enhance the development of thinking skills among children. Teaching strategies include placing the cognitive demand on the child; drawing the child's attention to a discrepancy, contradiction, or inconsistency; and involving the child in mental activity that requires going beyond the obvious concrete event. It has also been suggested that teachers should encourage students to interact with each other--to generate cognitive demands on their fellow students. (BB)

THINKING AND THE TEACHING OF THINKING FOR CHILDREN

Jianhua Feng

The Need for the Teaching of Thinking

Educators, psychologists, philosophers, and anthropologists are writing profusely about thinking. Even though thinking is "essential to our nature as human beings" (Lockheed, 1983). There seems to be a rediscovery of the significance of the function of thinking. This sudden interest in thinking and the teaching of thinking derives from a complex set of factors, according to Crandall (1988), such as (1) a concern about declining test scores and studies that indicate a limited amount of time being devoted to encouraging and developing thinking; (2) a long-held (since Plato, Aristotle, or at least John Dewey) belief that the goal of education is the development of capable thinkers; and (3) a concern that the demands of future societies require effective thinkers and capable problem-solvers. As Beyer (1987) claims, for many reasons we should be attending consiously and systematically to improving the thinking abilities of our children.

Changes in our world give urgency to serious attention to teaching thinking in education. In years past, societal change occured slowly. The answers to yesterday's questions were worth remembering because those questions and the conditions inspiring them were bound to repeat, so those answers would be directly applicable again. Such circumstances, however, rarely exist today. The rapid, continued shrinking of our world, the scope of change, and the new changelles this poses make it necessary to

invent new responses and initiatives rather than simply recall old ones. Doing this requires an ability to engage in thinking operations beyond the level of simple recall. Exclusive reliance on past information and knowledge appears to be increasingly shaky as a basis for dealing with the fast changing social, political, and economical worlds in which we live. As the world changes, our knowledge and information about the world also changes, and even out-dated, thinking skills, however, generally remain constant in their utility for processing information of whatever kind. As Robert Sternberg (1985) points out:

"Bodies of knowledge are important, of course, but they often become out-dated. Thinking skills never become out-dated. To the contrary, they enable us to acquire knowledge and to reason with it, regardless of the time or place or the kinds of knowledge to which they are applied" (P. 55).

Teaching thinking thus takes on increasing importance as a survival skill for society as a whole as well as for individuals. Such teaching can equip individuals with the tools needed to deal constructively with whatever kinds of information and conditions may typify the future (Beyer, 1987).

Effective, skillful thinking is neither an incidental outcome of experience nor an automatic product of study in any particular subject area. Most individuals, if left to their own devices, do not seem to develop to the fullest the skills of thinking of which they are capable. Skillful thinking is not as natural as it may appear or as it is assumed to be. As Perkins (1985) asserts, proficiency in thinking is in many ways more artificial than natural. It requires deliberate, continuing instruction,

guidance, and practice in order to develop to its full potential. Schools thus should offer an appropriate setting and expertise for instruction in those artifices of thinking that enable individuals to develop the proficiency required for success in school and in today's world. "The teaching of thinking can and should be carried on throughout each school's curriculum, across all grade levels, and in all subjects"(Beyer, 1987).

The Nature of Thinking

Thinking is a term we often use but rarely define precisely. When "thinking" is mentioned, different people hear different things, depending on their discipline or point of view. Definitions of the verb *to think* range across a broad array of mental functions from reflection, mediation, and cogitation to mental actions such as conceptualization and problem-solving (Sigel, 1984). Various experts in the field look at thinking differently. Some believe thinking has a value or ethical dimension, others see it as processing information, and still others look for fluency, flexibility, originality, and elaboration as signs of thinking skills in action. Others examine the nature of critical thinking and how it differs from a "skills" approach. Each "thinker" uses his or her approach to measure thinking and to develop programs to encorage the use of thinking skills.

According to Beyer (1987), thinking, in its broadest sense, is the search for meaning. It consists either of finding meaning assumed to exist already or of making meaning out of something that has not readily apparent meaning. It is, as John Dewey (1910) wrote years ago, "that operation in which present facts suggest other facts (or the truth) in such a way as to include

belief in the latter upon the ground or warrant of the former". Thinking, in short, is the mental process by which individuals make sense out of experience. Thinking engages a multitude of mental operations, from recalling to processing to evaluating. More precisely, thinking is the mental process by which individuals manipulate sensory input and recalled perceptions to formulate thoughts, to reason about, and/or to judge.

Beyer (1987) claims that thinking consists of at least three key components -- cognitive operations, certain kinds of knowledge, and certain attitudes and dispositions. The three components of thinking are closely interrelated. Each builds out of, and contributes to, the others. The more knowledge one has about a subject and about various heuristics related to it, the better able one is to use general thinking operations to their maximum effect. What one understands about the nature of knowledge informs and supports attitudes of caution and care in processing information, generating thinking, and accepting as solid or reliable the products of thinking. In any thinking act, these three components are so interwined they are often impossible to separate one from the other.

Thinking is further distinguished by other important characteristics, according to Beyer (1987). First, thinking is, generally, purposeful. People think for a purpose, usually to resolve a discordant situation -- to close a perceived gap between what is and what should or is desired to be. Secondly, thinking is developmental. The structures and contexts of any thinking operation and of thinking as a whole become more sophisticated and complex as individuals grow and develop physically and as they accumulate experience. Thirdly, thinking occurs in different

modalities: individuals think in figurative, symbolic, verbal, quantitative, and spatial modalities.

Thinking does not occur in a vacuum. There is also a contextual dimension to thinking. Any act of thinking involves not only the components of thinking but also factors external to the mind. The proficiency of the individual doing the thinking, the purpose for wich it is engaged, the modalities in which it is employed, and the environment(s) in which thinking occurs all shape how thinking process is excuted (Beyer, 1987).

The environmental context has a number of important dimensions. One of these is time. Any thinking act occurs over time, and it is affected by its duration, or amount of time devoted to it, as much as by hte data processed and the incidents occuring in the environment as thinking occurs. The arena is a second part of any thinking environment. Participating in an arguement whose purpose is to persuade others that a given position is the "best" position employs somewhat different cognitive operation, attitudes, and knowledge than does participating in a discussion whose final goal is uncovering the "truth". A third part of any thinking environment is the subject or topic being thought about and the data or subject matter being used. The substantive content of thinking informs and shapes how one think about it. Specific thinking operations employed in history may differ somewhat in construct from operations employed in linguistic or mathematical data. As the environment changes, so to some extent does how we think.

From a constructivist perspective, Sigel (1984) defines thinking as an active process involving a number of denotable mental operations such as induction, deduction, reasoning,

sequencing, classification, and definition of relationships. Each of these processes can function separately or in combination to meet environmental demands such as problem finding and problem solving. Thinking, according to Sigel (1984), develops under the influence of three conditions relavant for education: children's developmental levels, their social-emotional states, and their cultural milieu (including the school as well as the broader society).

Piaget (1950) showed that the child is an active constructor inherently predisposed to thinking activities. The child by nature is able to assimilate knowledge from experience and to organize this knowledge through a variety of mental operations. The aspects of experience the child will attend to and the ways he or she will organize it will be limited, however, by the child's developmental level. According to Piaget (1950,, thinking competence evolves through stages, and certain competences and skills emerge at each stage. For example, children at the concrete operational stage have more difficulty dealing with logical deductive reasoning than those at a formal stage.

Sigel (1984) also points out that how we think, what we think about, and how we carry out our thoughts are in part dependent on what kind of a person we are, our attitudes and feelings about our competence, and whether we are willing to take risks, be flexible, and so on. All these characteristics affect the thought process, facilitating or inhibiting its effectiveness. Such factors as interest, curiosity, and enthusiasm can influence the quality of thought positively while text anxiety, fear of failure, and negative attitudes toward the task can have adverse effects on the quality of thought.

Cultural factors also influence how we think and what we think about. Although it is true that humans, by their very biological similarity, can employ a wide array of thinking skills, the use of these skills will vary as a function of cultural milieu. For example, in Western thought, it is common to think in terms of casual-connections, of discoverying relationships among discrete events, and of placing value on analytic and synthetic activities. These processes, however, may not necessarily be employed in non-Western cultures. Even the notion of an objective reality is not accepted by all cultures (Sigel, 1984).

Differently from both Beyer and Sigel, Nickerson and his collegues (1985) view thinking as involving *encoding* the matter thought about and *operating* on the encoded representation to achieve some *goal*. They consider the question of what factors limit effective thinking, and suggest a tentative answer around five steps of concepts: (1) where limits appear -- in encoding, operations, or goals; (2) what sorts of limits appear -- limits in cognitive style, know-how, encoding of situations, or cognitive abilities; (3) whether thinking is best guided by complex rule systems such as the rules of logic or by mental models; (4) whether rules and models are best exercised implicitly, or explicitly and consciously; and (5) the reciprocal limits of the weakness that comes from lack of breadth in specific know-how that serves a particular context powerfully. Through analysis of these limits, they further propose that, ideally, instruction to enhance thinking skills should adress all three of the aspects --encoding, operations, and goals; concerntrate on fostering cognitive style and know-how, focus on mental models more than rule systems when possible, emphasize explicit over implicit models and rules, and

teach both general know-how and specific powerful know-how for important kinds of thinking situations (Nickerson, et al, 1985).

The Teaching of Thinking for Children

"The teaching of thinking skills is a lot like the weather. Almost everybody talks about it, but few educators seem able to do much to improve it" (Beyer, 1984). Ever since the turn of the century, American schools have considered mastery of thinking skills a major goal of instruction in almost all subject area. Considerable evidence suggests that we still have a long way to go in achieving this goal. Cruthfield (1969) suggests that the neglect of the teaching of thinking skills is due to two ill-founded assumptions: (1) that these skills cannot be taught; and (2) that they need not be taught. Evidence is accumulating, Crutchfield claims, that both assumptions are wrong: high-level thinking skills can be improved by training, and it is not safe to assume that such skills will emerge autometically as a matter of development or maturation.

"The taching of thinking can and should be carried on throughout each school's curriculum, across all grade levels and in all subjects," claims Beyer (1987). Ther are, according to Beyer, at least two kinds of reasons. One has to do with the nature of thinking and another is related to the mutual interrelationships of thinking and subject matter. The various cognitive skills and strategies constituting things are not learned once and for all at a particular grade level or time. Thinking operations grow and develop over time as an individual becomes more experienced in their use in a variety of purpose. To be successful, the teaching of thinking must provide continuing

attention to these skills and strategies once they have been introduced. Moreover, thinking operations and the subject matter and types of data and media with which they are used affect one another in many ways. Thinking skills and knowledge are interdependent. "Thinking means thinking about something" (Nickerson et al, 1985). On the one hand, thinking is essential to the acquisition of knowledge, and on the other, knowledge is essential to thinking. "We must creat a school where the study of human thought is a central mission, where the cultivation of the intellect is comfortably woven with the study of values, the mastery of information, and trairing in the basic subjects"(Joyce, 1985).

Various experts suggest different models with different approaches to the teaching of thinking from different perspective about thinking. Some suggest thinking should be taught *as a subject* focusing on specific operations and skills (Beyer, 1987), some propose thinking skills should be taught *with subjects,* emphasizing thinking skills involved in specific subject (Nickerson, 1985). From the constructivist perspective on cognitive devlopment, Sigel (1984) suggests that three components should be critical to the teaching of thinking to young children: concept of the child, of the context, and of teaching strategies. Constructivists view the child as a constructor of knowledge, and assumes that (1) the individual develops by actively constructing his reality; (2) development takes place through a process of discrepancy resolutions, and (3) discrepancy perception is limited by the individual's current expectations or knowledge. Cognitively, the child devlops by recognizing and resolving dicrepancies, that is, inconsistencies between what is expected

and what actually occurs in the environment. Sigel (1984) suggests the following distancing strategies as teaching tools that can be used to enhance the devlopment of thinking: (1) Place the cognitive demand on the child. For this purpose, an authentic, carefully worded question is more effective than a statement. (2) Draw the child's attention to a discrepancy, contradiction, or inconsistency. A discrepancy can only be perceived if the child is at a suffiently advanced devlopmental stage to detect the discrepancy. Inquiry that resolves the illogic and results in a new integration of ideas should follow. (3) Involve the child in mental activity that requires going beyond the obvious concrete event -- how far beyond will depend on the child's understanding of the task and what the teacher wants to know about it. Moreover, Sigel (1984) suggests that teachers should encourage students to interact with each other -- to generate cognitive demands on their fellow students. By developing skills in group management, teachers can become adept at creating a social climate conducive to the use of inquiry strategies.

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